Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Spectrum Horizons James Edwin Whedbee Petition for Rulemaking to Allow Unlicensed Operation in the 95-1,000 GHz Band	ET Docket No. 18-21 RM-11795

COMMENTS OF GOOGLE LLC

Google supports the Commission's examination of ways to spur new technologies and services in frequencies above 95 GHz.[1] A measure of regulatory certainty is needed to provide innovators assurance and to support investment in technologies that take advantage of this lightly used spectrum. Opportunities for innovation, however, can be established without adopting service rules at this time. Indeed, establishing service rules too early could foreclose options for innovative new technologies that have not yet been imagined.

Instead, the Commission should recognize that the development of services above 95 GHz is at a very early stage, and encourage experimentation by proceeding with the Spectrum Horizons experimental radio license program. Tailored rules for experimental licensing in this range will both provide predictability and expand opportunities to gather technical data that can inform future service rules.

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[1] *See In the Matter of Spectrum Horizons, et al.*, Notice of Proposed Rulemaking and Order, ET Docket No. 18-21, RM-11795 (rel. Feb. 28, 2018) (NPRM).

I. Adopting Detailed Service Rules for Frequencies Above 95 GHz Is Premature

The NPRM proposes to adopt service rules under Part 101 for 36 GHz of spectrum allocated to the fixed service in various ranges from 95 GHz to 241 GHz, and seeks comment on potential service rules for an additional 48.2 GHz of bandwidth between 158.5 GHz and 275 GHz.[2] The NPRM also contains proposals to designate 15.2 GHz across 122 GHz to 246 GHz for unlicensed use under Part 15.[3] The proposed regulations address limits on EIRP, antenna gain, out-of-band emissions, and minimum bit rate for the fixed service, and average and peak power limits for unlicensed operations.[4]

Adopting such service rules, which are nearly as specific as those in place for much lower-frequency spectrum, would be premature. Aside from the results of operations under approximately a dozen experimental licenses issued so far,[5] the Commission lacks reliable data on use of bands above 95 GHz in the United States. With rapid advances in hardware technology, the capabilities of devices in these bands are changing quickly. Current knowledge is insufficient for reliable predictions about the path of this evolution, especially for bands in the upper 100 GHz range and above, where there has been virtually no development of commercial wireless communications technology so far. First encouraging the collection of knowledge on both the technical and commercial aspects of using frequency bands above 95 GHz would enable informed construction of appropriate service rules at the right time.

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[2] *See* NPRM ¶ 28.
[3] *Id.* ¶ 54.
[4] *Id.* ¶¶ 32, 56.
[5] *Id.* ¶ 67.

Indeed, while adopting service rules at this early stage would provide certainty for future uses of bands above 95 GHz, it would also stifle innovation and diverse commercial development. Rules would presuppose the nature of future systems and services, and may be difficult to change. This trade-off between flexibility and certainty is inherent in establishing service rules, and the Commission should be careful not to favor certainty too early in the development of bands above 95 GHz. At a minimum, it is far too soon to envision an appropriate regulatory framework for the virtually unexplored commercial applications well above 100 GHz.

The Commission therefore should collect further technical information prior to adopting specific service rules for bands above 95 GHz. For example, additional technical information is needed regarding the feasibility of sharing between active and passive services in bands that are currently allocated exclusively to passive services.[6] Long before the emergence of commercial interest in bands above 95 GHz, substantial blocks of spectrum were allocated to passive services exclusively. The ability to share these allocations should be examined going forward. These investigations will inform decisions about the frequency ranges where fixed or other services can be authorized, as well as any potential changes to existing stipulations such as Footnotes US74 and US161 that are intended to protect the radio astronomy service.[7]

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[6] NPRM, Table 1.

[7] *See* 47 C.F.R. § 2.106, n.US74 (stating that radio astronomy observatories operating in most frequency bands listed in Footnote US246 are protected from unwanted emissions from other stations only to the extent the emissions exceed those permitted under technical standards or criteria applicable to the service in which the station operates); *id.* n.US161 (listing radio astronomy service locations operating at 81-86 GHz, 92-94 GHz, and 94.1-95 GHz that are protected from fixed stations by use of coordination distances).

II. The Commission Should Adopt Spectrum Horizons Experimental Radio License Rules that Support Innovation and Investment

While restrictive service rules are undesirable at this early date, the Commission should provide greater opportunity by adopting experimental license rules specifically for bands above 95 GHz. The proposed Spectrum Horizons experimental radio license program, with the modifications and clarifications discussed below, is an appropriate mechanism to achieve these goals.

A. Eligibility and Filing Requirements

As proposed in the NPRM, applicants for Spectrum Horizons experimental licenses should be required to submit a narrative statement explaining the new technology or service that is the subject of the application.[8] Details specifically related to interference coordination, including frequency band(s), maximum power, emission designators, areas of operation including latitude and longitude, and number and general types of devices to be used should be publicly available, as well as searchable through the Commission's online database. The licensee, however, should be permitted to redact from public view details in the narrative statement as necessary to protect non-public, commercially sensitive information.[9]

B. Available Frequencies

No bands between 95 GHz and 3 THz should be off-limits to Spectrum Horizons experimental licensees. Applications for any frequencies should be considered, subject

[8] NPRM ¶ 76.
[9] *See* 47 C.F.R. § 0.457(d) (listing materials, including trade secrets and commercial and financial information, that the Commission does not routinely make available for public inspection); *id.* § 0.459 (describing procedures to request that the Commission afford confidential treatment to materials).

to analysis of harmful interference to incumbent systems. That analysis should be based solely on existing incumbent systems and incumbent systems with a very high likelihood of deployment during the term of the experimental license, rather than on predictions that "future systems" might be deployed while the experimental license is in effect. Such future systems can be protected if and when they materialize.

C. Scope of Grants

The Commission should adopt its proposal to provide Spectrum Horizons experimental radio licensees "substantial flexibility to conduct long-term experiments over a wide geographic area and frequency range, market equipment if necessary, and adapt their program of experimentation as needed."[10]

Also, as the Commission proposes, these experimental licenses should be non-exclusive and not be accompanied by any "assurance that experimentation would lead to the establishment of an authorized service."[11] Experimental licensees should be prohibited from causing harmful interference to established radio services and be held responsible for remedying any such interference.[12] However, the nature and utilization of the 95 GHz to 3 THz frequency range are such that harmful interference should be very rare. While licensees must have the obligation to remedy *actual* cases of harmful interference, incumbents and other experimental licensees should not be allowed to use worst-case predictions of potential interference to block a Spectrum Horizons experimental license. Nor should a Spectrum Horizons license be retroactively limited or

[10] NPRM ¶ 78.
[11] *Id.*
[12] *Id.*

terminated based on allegations of interference, without clear technical showings of harm as well as causation.

These procedures are important to provide Spectrum Horizons experimental licensees a level of assurance that they will be able to engage in development and market trials without being pushed aside by mere claims of harmful interference from incumbents or other licensees. This assurance would remove a substantial risk factor and encourage greater levels of investment in bands above 95 GHz, thus allowing experimental operators to generate the data the Commission needs in order to set future service rules for commercial services.

D. License Term and Interim Reporting Requirements

Spectrum Horizons experimental radio licenses should have a ten-year term.[13] While technology will develop rapidly in bands above 95 GHz, a ten-year term provides sufficient time to develop, deploy, and test new hardware, investigate the market for systems and services enabled by the hardware, and conduct sufficiently lengthy trials to gauge the interest in and necessity of permanent allocations and service rules to support operations going forward.

During the ten-year term, the Commission should require the licensee to submit a midpoint report[14] and a final report, from which the licensee should be permitted to redact non-public, commercially sensitive information. These reports will help the Commission assess the technical and commercial challenges related to development

[13] *Id.* ¶ 79.
[14] *Id.*

and deployment of systems above 95 GHz, facilitating the formulation of reasonable allocations and service rules going forward.

E. Technical Support for Licensing

After the Commission adopted rules to create the Program Experimental License and other new experimental license schemes under Part 5,[15] it took more than four years to build infrastructure (including a website) to implement the revised framework.[16] To avoid such expense and delays here, the Commission should attempt to implement the new Spectrum Horizons experimental radio license program using existing Commission infrastructure wherever possible. To the extent new infrastructure is essential, the Commission should support the Spectrum Horizons licenses temporarily using existing resources while the new framework is being constructed. Otherwise, Spectrum Horizons innovations could be delayed while Commission systems are being built.

III. Conclusion

The Commission should wait to adopt service rules for bands above 95 GHz until it has access to sufficient technical and market data to avoid miscalculations that limit development of other systems and services that better meet consumer and business needs. Optimizing the Spectrum Horizons experimental radio license rules to provide flexibility and regulatory assurance to innovators and investors interested in frequencies

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[15] *See In the Matter of* P*romoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules, et al.*, Report and Order, 28 FCC Rcd. 758, ¶¶ 20-96 (2013) (establishing program experimental license rules).

[16] *Office of Engineering and Technology Announces Acceptance of Applications for Program Experimental Licenses*, Public Notice, 32 FCC Rcd. 3043 (2017).

above 95 GHz would not only advance innovation, but also allow experimental licensees to generate the data requisite to establishing optimal service rules in the future.

Respectfully submitted,

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